

MC100LVEL34

3.3V ECL ÷2, ÷4, ÷8 Clock Generation Chip

The MC100LVEL34 is a low skew ÷2, ÷4, ÷8 clock generation chip designed explicitly for low skew clock generation applications. The internal dividers are synchronous to each other, therefore, the common output edges are all precisely aligned. The V_{BB} pin, an internally generated voltage supply, is available to this device only. For single-ended input conditions, the unused differential input is connected to V_{BB} as a switching reference voltage. V_{BB} may also rebias AC coupled inputs. When used, decouple V_{BB} and V_{CC} via a 0.01 μF capacitor and limit current sourcing or sinking to 0.5 mA. When not used, V_{BB} should be left open.

The common enable ($\overline{\text{EN}}$) is synchronous so that the internal dividers will only be enabled/disabled when the internal clock is already in the LOW state. This avoids any chance of generating a runt clock pulse on the internal clock when the device is enabled/disabled as can happen with an asynchronous control. An internal runt pulse could lead to losing synchronization between the internal divider stages. The internal enable flip-flop is clocked on the falling edge of the input clock; therefore, all associated specification limits are referenced to the negative edge of the clock input.

Upon start-up, the internal flip-flops will attain a random state; the master reset (MR) input allows for the synchronization of the internal dividers, as well as multiple LVEL34s in a system.

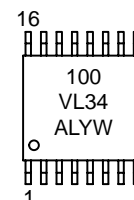
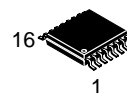
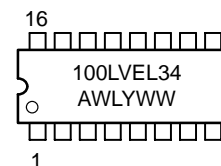
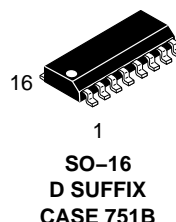
- 50 ps Typical Output-to-Output Skew
- Synchronous Enable/Disable
- Master Reset for Synchronization
- 1.5 GHz Toggle Frequency
- The 100 Series Contains Temperature Compensation.
- PECL Mode Operating Range: $V_{CC} = 3.0 \text{ V}$ to 3.8 V with $V_{EE} = 0 \text{ V}$
- NECL Mode Operating Range: $V_{CC} = 0 \text{ V}$ with $V_{EE} = -3.0 \text{ V}$ to -3.8 V
- Open Input Default State
- LVDS Input Compatible



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MARKING DIAGRAMS*



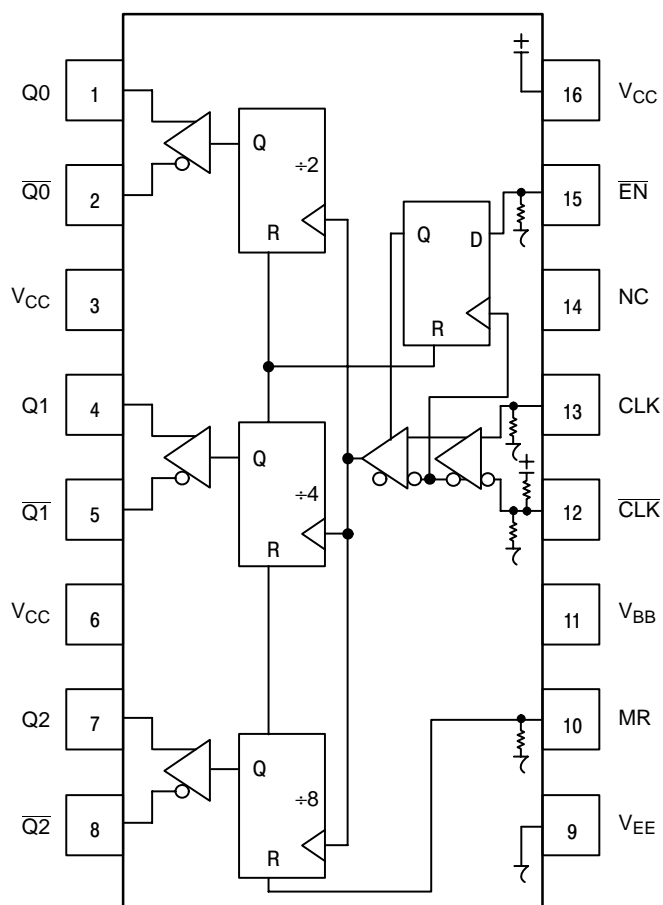
A = Assembly Location
L, WL = Wafer Lot
Y = Year
W, WW = Work Week

*For additional information, refer to Application Note AND8002/D

ORDERING INFORMATION

Device	Package	Shipping
MC100LVEL34D	SO-16	48 Units/Rail
MC100LVEL34DR2	SO-16	2500 Units/Reel
MC100LVEL34DT	TSSOP-16	96 Units/Rail
MC100LVEL34DTR2	TSSOP-16	2500 Units/Reel

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Warning: All V_{CC} and V_{EE} pins must be externally connected to Power Supply to guarantee proper operation.

Figure 1. 16-Lead Pinout (Top View) and Logic Diagram

PIN DESCRIPTION

PIN	FUNCTION
CLK*, \overline{CLK} **	ECL Diff Clock Inputs
EN*	ECL Sync Enable
MR*	ECL Master Reset
Q0, $\overline{Q0}$	ECL Diff +2 Outputs
Q1, $\overline{Q1}$	ECL Diff +4 Outputs
Q2, $\overline{Q2}$	ECL Diff +8 Outputs
V_{BB}	Reference Voltage Output
V_{CC}	Positive Supply
V_{EE}	Negative Supply
NC	No Connect

* Pins will default LOW when left open.

** Pins will default to $V_{CC}/2$ when left open.

FUNCTION TABLE

CLK	EN	MR	FUNCTION
Z	L	L	Divide
ZZ	H	L	Hold Q_{0-3}
X	X	H	Reset Q_{0-3}

Z = Low-to-High Transition

ZZ = High-to-Low Transition

ATTRIBUTES

Characteristics	Value
Internal Input Pulldown Resistor	75 k Ω
Internal Input Pullup Resistor	37.5 k Ω
ESD Protection	Human Body Model Machine Model Charged Device Model
	> 2 kV > 200 V > 2 kV
Moisture Sensitivity, Indefinite Time Out of Drypack (Note 1)	Level 1
Flammability Rating	Oxygen Index: 28 to 34
	UL 94 V-0 @ 0.125 in
Transistor Count	210 Devices
Meets or exceeds JEDEC Spec EIA/JESD78 IC Latchup Test	

1. For additional Moisture Sensitivity information, refer to Application Note AND8003/D.

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MAXIMUM RATINGS (Note 2)

Symbol	Parameter	Condition 1	Condition 2	Rating	Units
V_{CC}	PECL Mode Power Supply	$V_{EE} = 0\text{ V}$		6	V
V_{EE}	NECL Mode Power Supply	$V_{CC} = 0\text{ V}$		-6	V
V_I	PECL Mode Input Voltage	$V_{EE} = 0\text{ V}$	$V_I \leq V_{CC}$	6	V
	NECL Mode Input Voltage	$V_{CC} = 0\text{ V}$	$V_I \geq V_{EE}$	-6	V
I_{out}	Output Current	Continuous Surge		50	mA
				100	mA
I_{BB}	V_{BB} Sink/Source			± 0.5	mA
T_A	Operating Temperature Range			-40 to +85	$^{\circ}\text{C}$
T_{stg}	Storage Temperature Range			-65 to +150	$^{\circ}\text{C}$
θ_{JA}	Thermal Resistance (Junction-to-Ambient)	0 LFPM	16 SOIC	100	$^{\circ}\text{C}/\text{W}$
		500 LFPM	16 SOIC	60	$^{\circ}\text{C}/\text{W}$
θ_{JC}	Thermal Resistance (Junction-to-Case)	std bd	16 SOIC	33 to 36	$^{\circ}\text{C}/\text{W}$
θ_{JA}	Thermal Resistance (Junction-to-Ambient)	0 LFPM 500 LFPM	16 TSSOP	138	$^{\circ}\text{C}/\text{W}$
			16 TSSOP	108	$^{\circ}\text{C}/\text{W}$
θ_{JC}	Thermal Resistance (Junction-to-Case)	std bd	16 TSSOP	33 to 36	$^{\circ}\text{C}/\text{W}$
T_{sol}	Wave Solder	<2 to 3 sec @ 248 $^{\circ}\text{C}$		265	$^{\circ}\text{C}$

2. Maximum Ratings are those values beyond which device damage may occur.

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100LEVEL DC CHARACTERISTICS, PECL $V_{CC} = 3.3\text{ V}$, $V_{EE} = 0\text{ V}$ (Note 3)

Symbol	Characteristic	-40°C			25°C			85°C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
I_{EE}	Power Supply Current	40	50	60	40	50	60	42	52	62	mA
V_{OH}	Output HIGH Voltage (Note 4)	2155	2280	2405	2155	2280	2405	2155	2280	2405	mV
V_{OL}	Output LOW Voltage (Note 4)	1355	1570	1725	1355	1570	1725	1355	1570	1725	mV
V_{IH}	Input HIGH Voltage (Single Ended)	2075		2420	2075		2420	2075		2420	mV
V_{IL}	Input LOW Voltage (Single Ended)	1355		1675	1355		1675	1355		1675	mV
V_{BB}	Output Voltage Reference	1775	1875	1975	1775	1875	1975	1775	1875	1975	mV
V_{IHCMR}	Input HIGH Voltage Common Mode Range (Differential) (Note 5)	1.2		3.3	1.2		3.3	1.2		3.3	V
I_{IH}	Input HIGH Current			150			150			150	μA
I_{IL}	Input LOW Current	$\frac{D}{\bar{D}}$	0.5 -150		0.5 -150			0.5 -150			μA

NOTE: LEVEL circuits are designed to meet the DC specifications shown in the above table after thermal equilibrium has been established. The circuit is in a test socket or mounted on a printed circuit board and transverse airflow greater than 500 lfm is maintained.

3. Input and output parameters vary 1:1 with V_{CC} . V_{EE} can vary +0.925 V to -0.5 V.

4. All loading with 50 Ω to $V_{CC} - 2.0\text{ V}$.

5. V_{IHCMR} min varies 1:1 with V_{EE} , V_{IHCMR} max varies 1:1 with V_{CC} . The V_{IHCMR} range is referenced to the most positive side of the differential input signal.

100LEVEL DC CHARACTERISTICS, NECL $V_{CC} = 0\text{ V}$, $V_{EE} = -3.8\text{ V}$ to -3.0 V (Note 6)

Symbol	Characteristic	-40°C			25°C			85°C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
I_{EE}	Power Supply Current	40	50	60	40	50	60	42	52	62	mA
V_{OH}	Output HIGH Voltage (Note 7)	-1145	-1020	-895	-1145	-1020	-895	-1145	-1020	-895	mV
V_{OL}	Output LOW Voltage (Note 7)	-1945	-1700	-1575	-1945	-1700	-1575	-1945	-1700	-1575	mV
V_{IH}	Input HIGH Voltage (Single Ended)	-1225		-880	-1225		-880	-1225		-880	mV
V_{IL}	Input LOW Voltage (Single Ended)	-1945		-1625	-1945		-1625	-1945		-1625	mV
V_{BB}	Output Voltage Reference	-1525	-1425	-1325	-1525	-1425	-1325	-1525	-1425	-1325	mV
V_{IHCMR}	Input HIGH Voltage Common Mode Range (Differential) (Note 8)	$V_{EE}+1.2$		0.0	$V_{EE}+1.2$		0.0	$V_{EE}+1.2$		0.0	V
I_{IH}	Input HIGH Current			150			150			150	μA
I_{IL}	Input LOW Current	$\frac{D}{\bar{D}}$	0.5 -150		0.5 -150			0.5 -150			μA

NOTE: LEVEL circuits are designed to meet the DC specifications shown in the above table after thermal equilibrium has been established. The circuit is in a test socket or mounted on a printed circuit board and transverse airflow greater than 500 lfm is maintained.

6. Input and output parameters vary 1:1 with V_{CC} .

7. All loading with 50 Ω to $V_{CC} - 2.0\text{ V}$.

8. V_{IHCMR} min varies 1:1 with V_{EE} , V_{IHCMR} max varies 1:1 with V_{CC} . The V_{IHCMR} range is referenced to the most positive side of the differential input signal.

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AC CHARACTERISTICS $V_{CC}= 0\text{ V}$; $V_{EE}= -3.8\text{ V}$ to -3.0 V or $V_{CC}= 3.0\text{ V}$ to 3.8 V ; $V_{EE}= 0\text{ V}$ (Note 9)

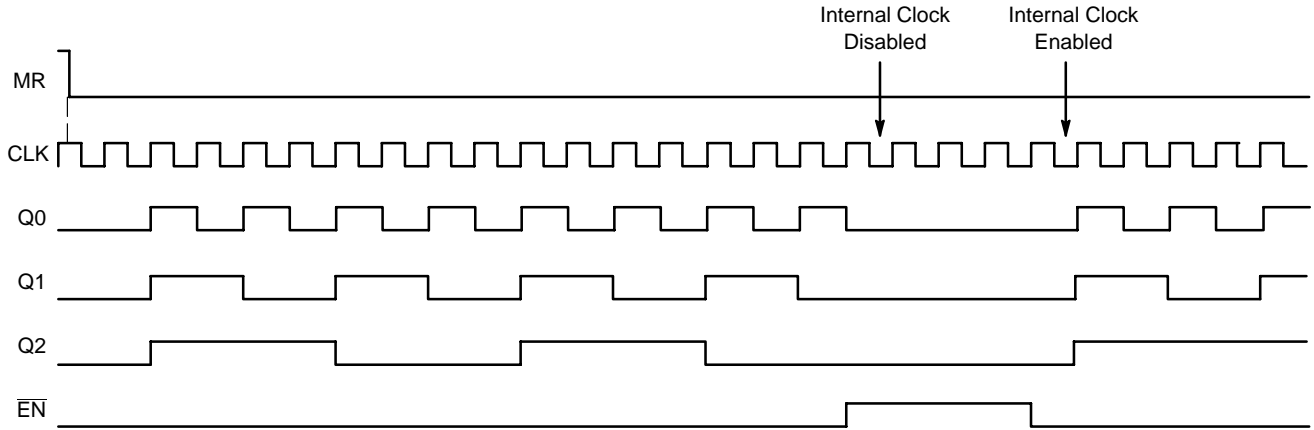
Symbol	Characteristic	-40°C			25°C			85°C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
f_{\max}	Maximum Toggle Frequency (See Figure 4. F_{\max}/JITTER)	1.5			1.5			1.5			GHz
t_{PLH} t_{PHL}	Propagation Delay to Output CLK to Q0, Q1, Q2 MR to Q	550 500	650 600	1000 1000	600 550	700 650	1000 1000	650 600	750 700	1000 1000	ps
t_{JITTER}	Cycle-to-Cycle Jitter (See Figure 4. F_{\max}/JITTER)		< 1			< 1			< 1		ps
t_{S}	Setup Time $\overline{\text{EN}}$	150	50		150	50		150	50		ps
t_{H}	Hold Time $\overline{\text{EN}}$	200	100		200	100		200	100		ps
t_{RR}	Set/Reset Recovery	300	200		300	200		300	200		ps
V_{PP}	Input Swing (Note 10)	150		1000	150		1000	150		1000	mV
t_{r} t_{f}	Output Rise/Fall Times Q (20% – 80%)	120	170	400	140	180	400	160	200	400	ps

9. Measured using a 750 mV source, 50% duty cycle clock source. All loading with $50\ \Omega$ to $V_{CC} - 2.0\text{ V}$.

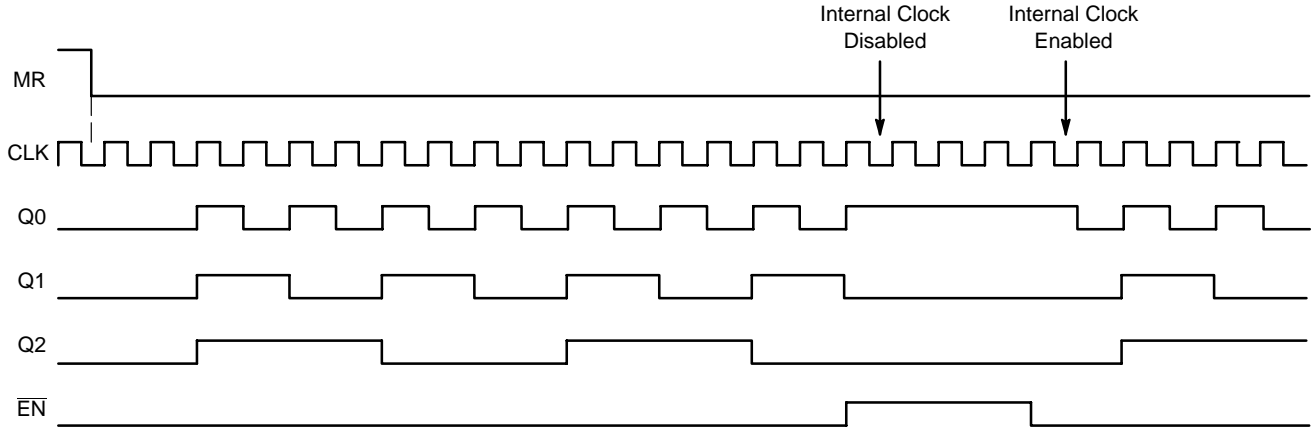
10. $V_{\text{PP}(\text{min})}$ is minimum input swing for which AC parameters guaranteed. The device has a DC gain of ≈ 40 .

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There are two distinct functional relationships between the Master Reset and Clock:



CASE 1: If the MR is de-asserted (H-L), while the Clock is still high, the outputs will follow the second ensuing clock rising edge.



CASE 2: If the MR is de-asserted (H-L), after the Clock has transitioned low, the outputs will follow the third ensuing clock rising edge.

Figure 2. Timing Diagrams

The \overline{EN} signal will “freeze” the internal divider flip-flops on the first falling edge of CLK after its assertion. The internal divider flip-flops will maintain their state during the freeze. When \overline{EN} is deasserted (LOW), and after the next falling edge of CLK, then the internal divider flip-flops will “unfreeze” and continue to their next state count with proper phase relationships.

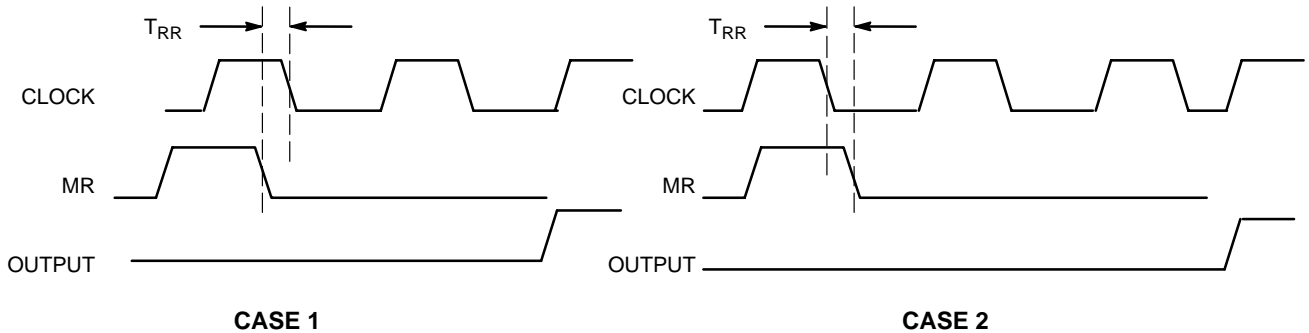


Figure 3. Reset Recovery Time

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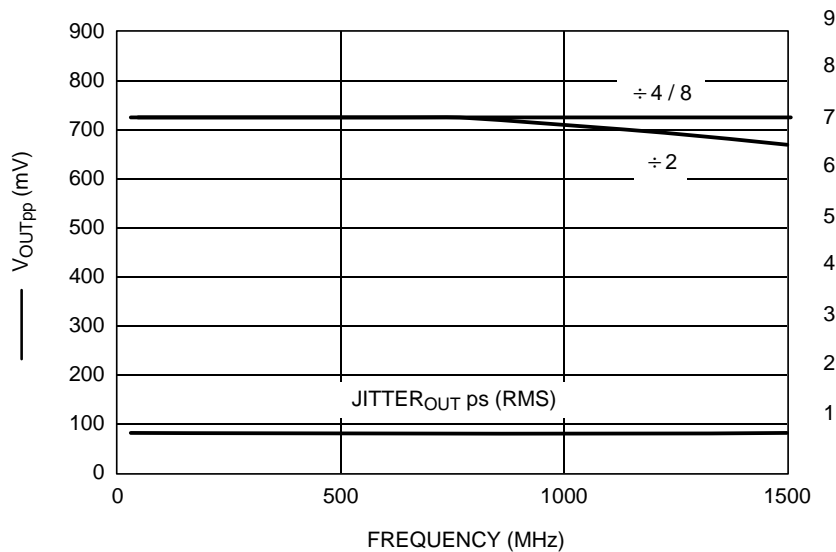


Figure 4. $F_{max}/Jitter$

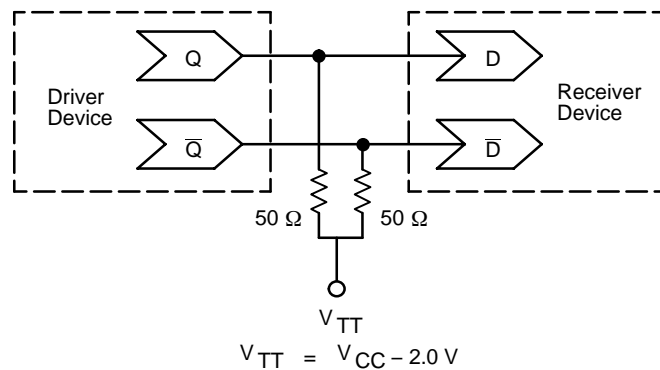


Figure 5. Typical Termination for Output Driver and Device Evaluation
(Refer to Application Note AND8020 – Termination of ECL Logic Devices.)

Resource Reference of Application Notes

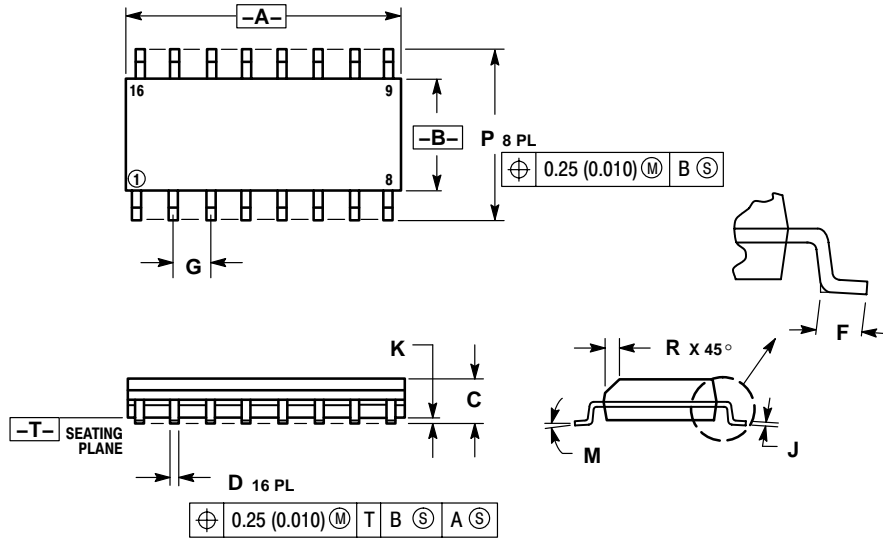
- AN1404** – ECLinPS Circuit Performance at Non-Standard V_{IH} Levels
- AN1405** – ECL Clock Distribution Techniques
- AN1406** – Designing with PECL (ECL at +5.0 V)
- AN1504** – Metastability and the ECLinPS Family
- AN1568** – Interfacing Between LVDS and ECL
- AN1650** – Using Wire-OR Ties in ECLinPS Designs
- AN1672** – The ECL Translator Guide
- AND8001** – Odd Number Counters Design
- AND8002** – Marking and Date Codes
- AND8009** – ECLinPS Plus Spice I/O Model Kit
- AND8020** – Termination of ECL Logic Devices

For an updated list of Application Notes, please see our website at <http://onsemi.com>.

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PACKAGE DIMENSIONS

SO-16
D SUFFIX
CASE 751B-05
ISSUE J



NOTES:

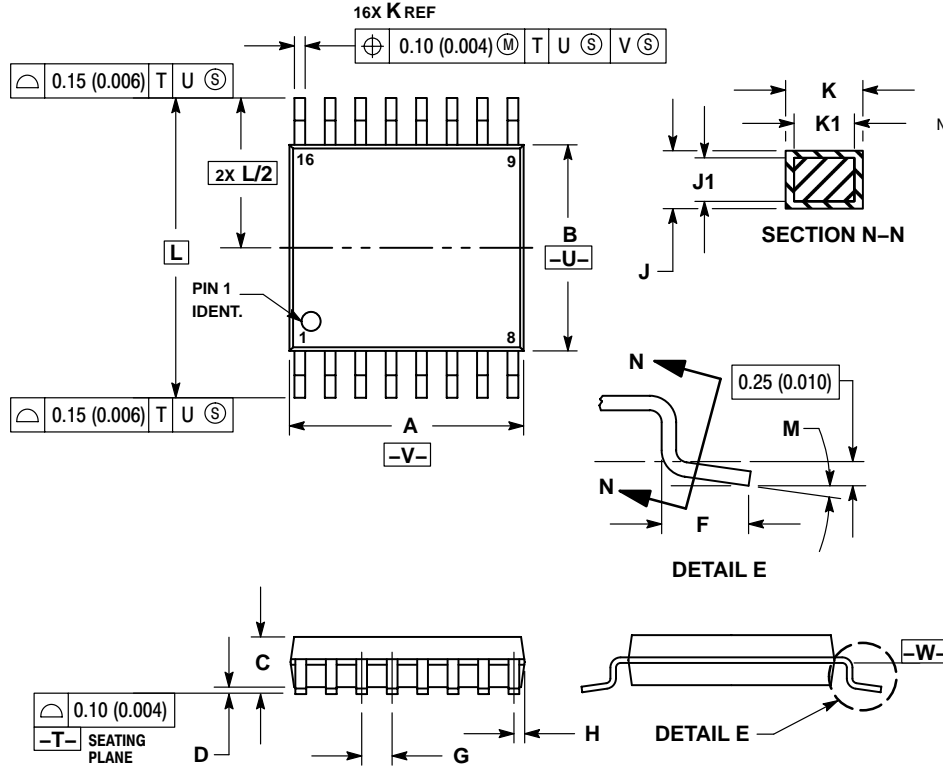
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSIONS A AND B DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 (0.005) TOTAL IN EXCESS OF THE D DIMENSION AT MAXIMUM MATERIAL CONDITION.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	9.80	10.00	0.386	0.393
B	3.80	4.00	0.150	0.157
C	1.35	1.75	0.054	0.068
D	0.35	0.49	0.014	0.019
F	0.40	1.25	0.016	0.049
G	1.27 BSC		0.050 BSC	
J	0.19	0.25	0.008	0.009
K	0.10	0.25	0.004	0.009
M	0°	7°	0°	7°
P	5.80	6.20	0.229	0.244
R	0.25	0.50	0.010	0.019

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PACKAGE DIMENSIONS

TSSOP-16
DT SUFFIX
CASE 948F-01
ISSUE O



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: MILLIMETER.
 3. DIMENSION A DOES NOT INCLUDE MOLD FLASH. PROTRUSIONS OR GATE BURRS. MOLD FLASH OR GATE BURRS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.
 4. DIMENSION B DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD FLASH OR PROTRUSION SHALL NOT EXCEED 0.25 (0.010) PER SIDE.
 5. DIMENSION K DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 (0.003) TOTAL IN EXCESS OF THE K DIMENSION AT MAXIMUM MATERIAL CONDITION.
 6. TERMINAL NUMBERS ARE SHOWN FOR REFERENCE ONLY.
 7. DIMENSION A AND B ARE TO BE DETERMINED AT DATUM PLANE -W-.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.90	5.10	0.193	0.200
B	4.30	4.50	0.169	0.177
C	---	1.20	---	0.047
D	0.05	0.15	0.002	0.006
F	0.50	0.75	0.020	0.030
G	0.65 BSC		0.026 BSC	
H	0.18	0.28	0.007	0.011
J	0.09	0.20	0.004	0.008
J1	0.09	0.16	0.004	0.006
K	0.19	0.30	0.007	0.012
K1	0.19	0.25	0.007	0.010
L	6.40 BSC		0.252 BSC	
M	0°	8°	0°	8°

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